

Keszthely 10/06/08

Testing dynamic models of AGB C-stars with uniform disc fits

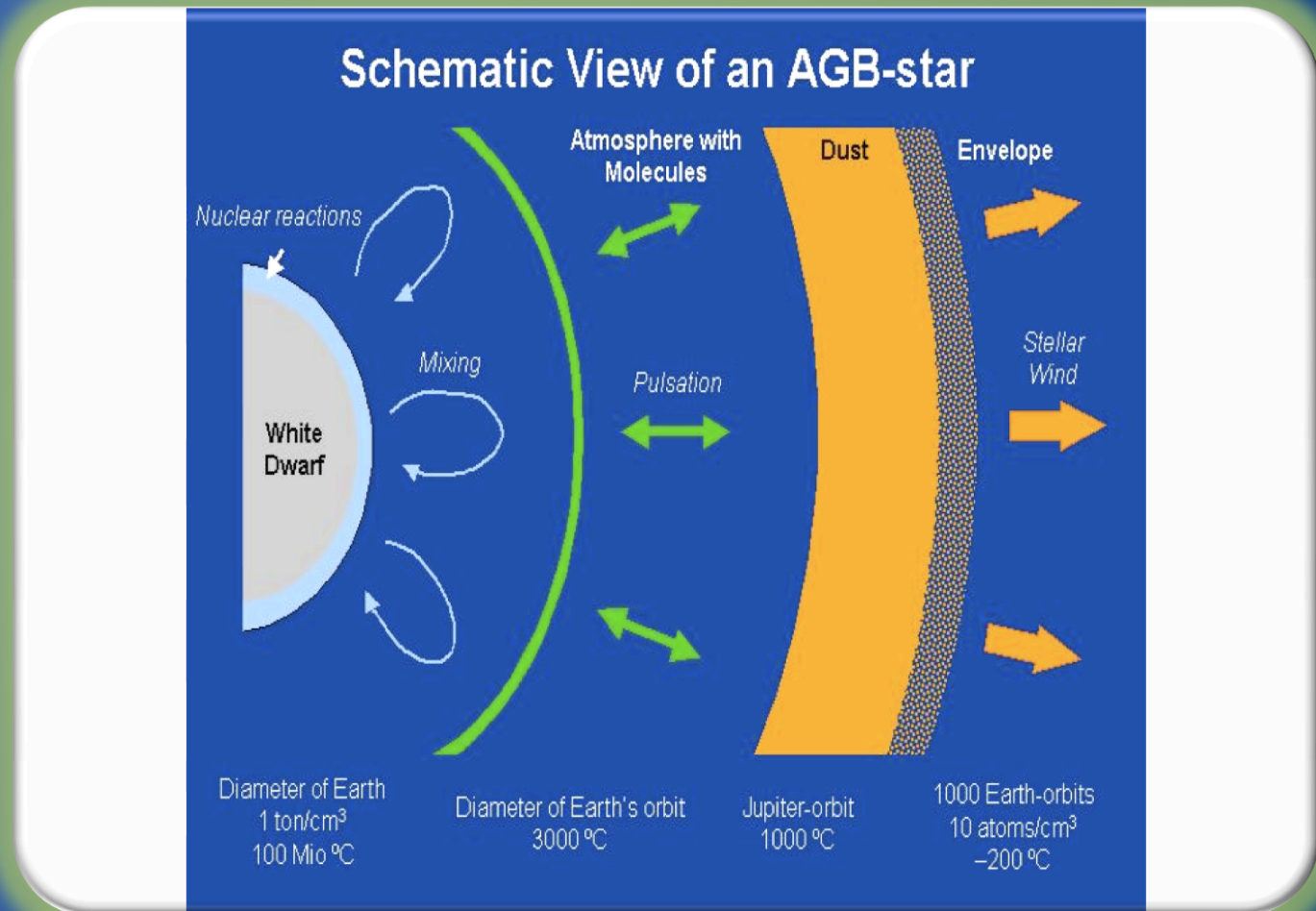
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AGB Carbon stars

- $M < 8 M_{\odot}$
- degenerate C-O core and an He/H-burning shell, a convective envelope.
- $[C/O] > 1$
- Presence of C_2 , C_2H_2 , C_3 , CN, HCN
- Dust: amorphous carbon



Schematic view of an AGB star - simple version (by J. Hron)

Why C-stars? Why Interferometry?

Important for stellar and galactic evolution:

- mass-loss responsible for enrichment of ISM
- understand the complicate interaction of pulsation and the stellar atmosphere
- comprehension dynamical processes of dust formation and mass loss

We need Interferometry because of...

High angular resolution to resolve the close circumstellar structure

→ understanding mass loss processes

→ studying the stratification and different opacity sources

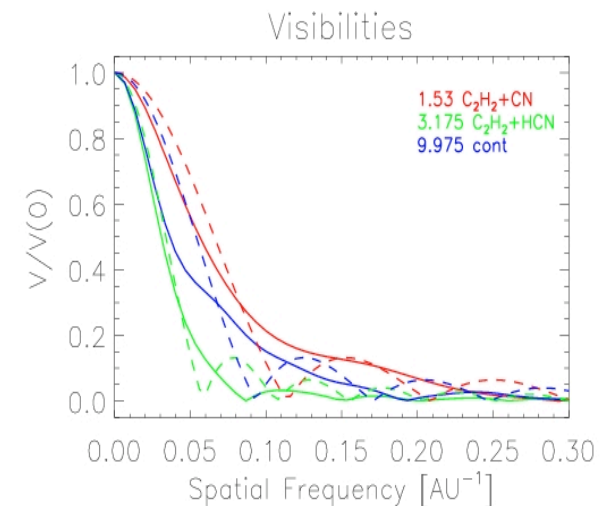
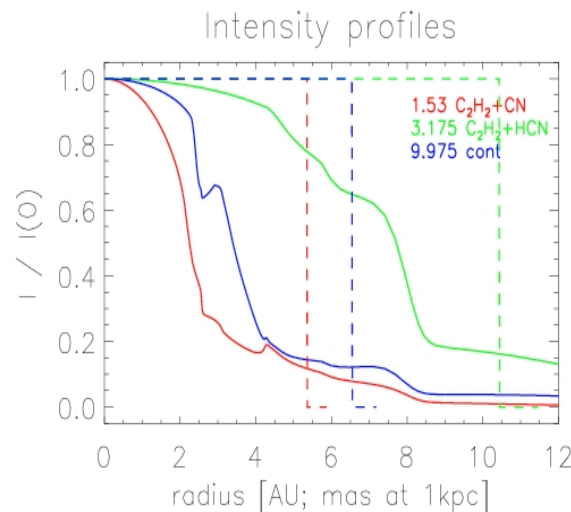
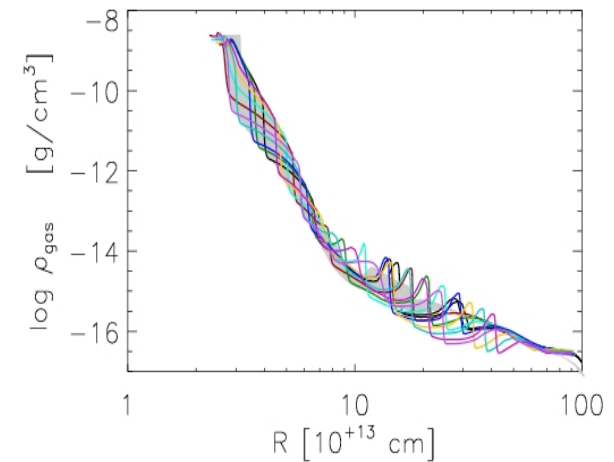
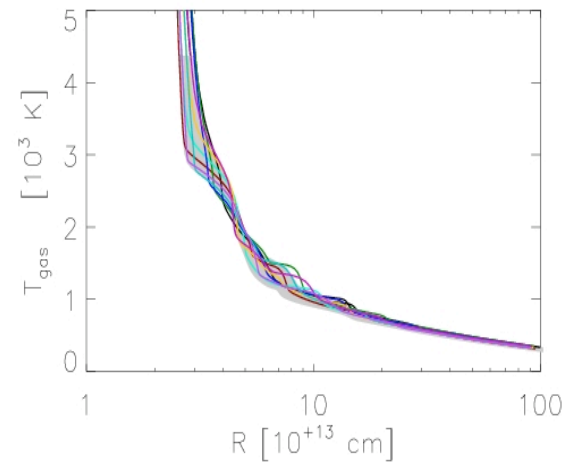
Complementary with other techniques (photometry and spectroscopy)

Dynamical models

C-star models (Höfner et al., 2003)
Profiles and visibilities
calculated for 21 narrow filters

Compute UD with
 $v=v_0$ at same spatial
frequency as model

Analyse $r(\text{UD})$ vs. λ ,
 $r(\text{UD})$ vs. phase,
(as Jacob & Scholz (2002)
for M-type models)

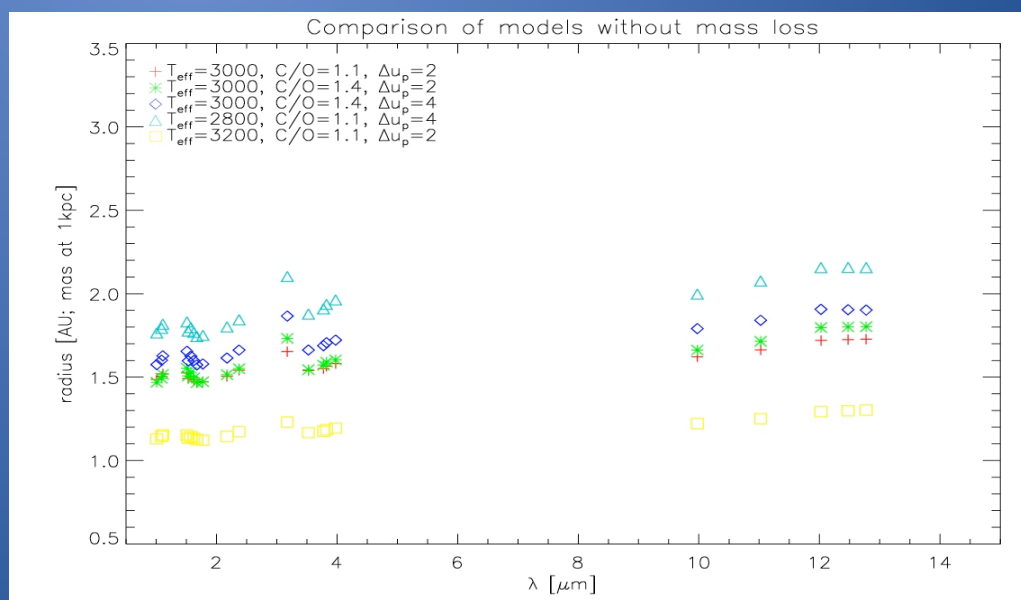
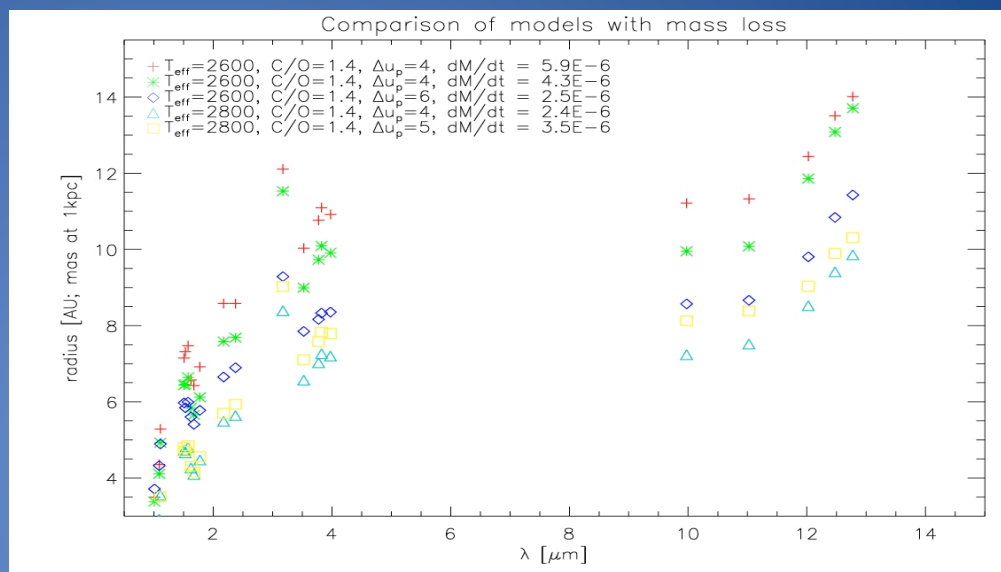


C-star models structures; Intensity and visibility profile

Radius versus λ

21 narrow filters in the near-to mid-IR chosen in a way to sample some particular features of the spectrum (e.g. C_2H_2).

UD-radius increases with λ ,
3.175 μm "jump" of the UD-radius due to C_2H_2 opacity



UD-Radius versus Time (phase)

UD-radius using:

1 point fit ($v=0.3$),
2 points ($v=0.1$ and
 0.4)

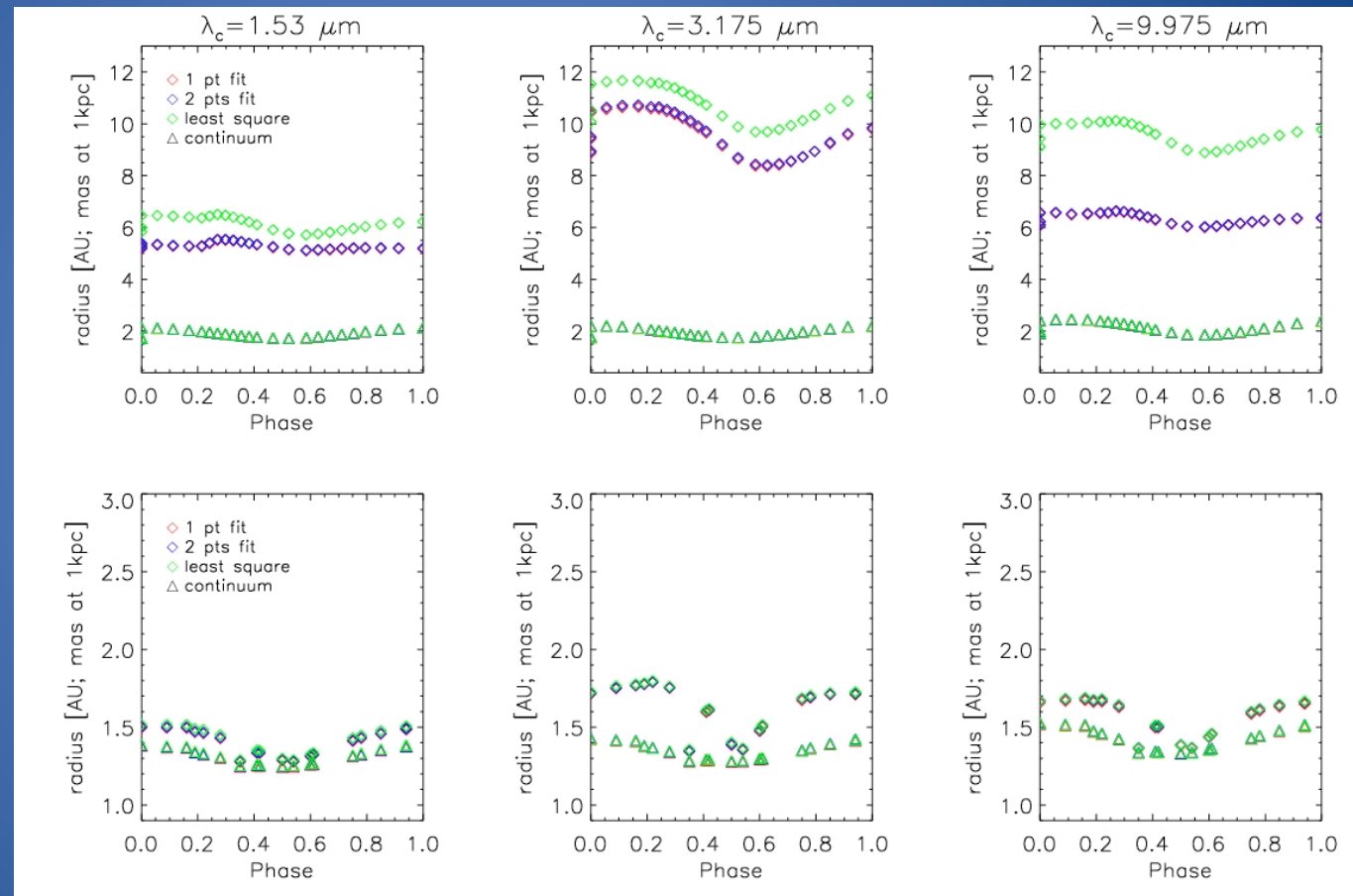
least square method
(all the points with
visibility > 0.1).

Models with mass loss
more extended;

We can observe the
periodic movement of
the stellar interior.

No mass loss: different
method same
behaviour;

Mass loss: least
square more extended



Conclusions

- A **dependence of UD-radius on wavelength** is evident and it is stronger in the case of models with dust included. Around **3 μm** and in the **N band** the star is **more extended** due to C_2H_2 opacity.
- Using only **1 or 2 points of visibility** to determine the UD-radius of the star we obtain **smaller radii**. The difference is stronger in the N band.
- The UD-radius is closer to the continuum UD-radius in the case of models without mass loss
- **The radius computed with the UD function has to be considered only a first guess for the real radius of the star.** The intensity profile and the visibility of a C-star is very far from being Uniform disk!

A serene landscape photograph of a lake at dusk. The sky is a mix of deep blue and soft pinkish-purple clouds. The water is calm, reflecting the sky and the surrounding landscape. On the right side, a large, dark green tree stands prominently, its reflection visible in the water. In the middle of the lake, a small white boat with a single mast is visible. To the left, there are some wooden structures, possibly docks or small boats, partially obscured by dark foliage. In the background, a range of low mountains or hills stretches across the horizon. The overall mood is peaceful and quiet.

Thank you!